

1 / 23

SEQUENCE LISTING

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<110> Sung Dr., Wing
<120> Xylanases with Enhanced Thermophilicity and Alkalophilicity
<130> 08-893220US
<140>
<141>
<160> 53
<170> PatentIn Ver. 2.1

<210> 1
<211> 184
<212> PRT
<213> Aspergillus niger

<400> 1
Ser Ala Gly Ile Asn Tyr Val Gln Asn Tyr Asn Gly Asn Leu Gly Asp
  1             5             10             15
Phe Thr Tyr Asp Glu Ser Ala Gly Thr Phe Ser Met Tyr Trp Glu Asp
             20             25             30
Gly Val Ser Ser Asp Phe Val Val Gly Leu Gly Trp Thr Thr Gly Ser
             35             40             45
Ser Asn Ala Ile Thr Tyr Ser Ala Glu Tyr Ser Ala Ser Gly Ser Ser
             50             55             60
Ser Tyr Leu Ala Val Tyr Gly Trp Val Asn Tyr Pro Gly Ala Glu Tyr
             65             70             75             80
Tyr Ile Val Glu Asp Tyr Gly Asp Tyr Asn Pro Cys Ser Ser Ala Thr
             85             90             95
Ser Leu Gly Thr Val Tyr Ser Asp Gly Ser Thr Tyr Gln Val Cys Thr
             100            105            110
Asp Thr Arg Ile Asn Glu Pro Ser Ile Thr Gly Thr Ser Thr Phe Thr
             115            120            125
Gln Tyr Phe Ser Val Arg Glu Ser Thr Arg Thr Ser Gly Thr Val Thr
             130            135            140
Val Ala Asn His Phe Asn Phe Trp Ala Gln His Gly Phe Gly Asn Ser
             145            150            155            160
Asp Phe Asn Tyr Gln Val Met Ala Val Glu Ala Trp Ser Gly Ala Gly
             165            170            175
Ser Ala Ser Val Thr Ile Ser Ser
             180

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2/23

<210> 2
 <211> 185
 <212> PRT
 <213> *Aspergillus tubingensis*

<400> 2
 Ser Ala Gly Ile Asn Tyr Val Gln Asn Tyr Asn Gln Asn Leu Gly Asp
 1 5 10 15
 Phe Thr Tyr Asp Glu Ser Ala Gly Thr Phe Ser Met Tyr Trp Glu Asp
 20 25 30
 Gly Val Ser Ser Asp Phe Val Val Gly Leu Gly Gly Trp Thr Thr Gly
 35 40 45
 Ser Ser Asn Ala Ile Thr Tyr Ser Ala Glu Tyr Ser Ala Ser Gly Ser
 50 55 60
 Ala Ser Tyr Leu Ala Val Tyr Gly Trp Val Asn Tyr Pro Gln Ala Glu
 65 70 75 80
 Tyr Tyr Ile Val Glu Asp Tyr Gly Asp Tyr Asn Pro Cys Ser Ser Ala
 85 90 95
 Thr Ser Leu Gly Thr Val Tyr Ser Asp Gly Ser Thr Tyr Gln Val Cys
 100 105 110
 Thr Asp Thr Arg Ile Asn Glu Pro Ser Ile Thr Gly Thr Ser Thr Phe
 115 120 125
 Thr Gln Tyr Phe Ser Val Arg Glu Ser Thr Arg Thr Ser Gly Thr Val
 130 135 140
 Thr Val Ala Asn His Phe Asn Phe Trp Ala His His Gly Phe His Asn
 145 150 155 160
 Ser Asp Phe Asn Tyr Gln Val Val Ala Val Glu Ala Trp Ser Gly Ala
 165 170 175
 Gly Ser Ala Ala Val Thr Ile Ser Ser
 180 185

<210> 3
 <211> 185
 <212> PRT
 <213> *Bacillus circulans*

<400> 3
 Ala Ser Thr Asp Tyr Trp Gln Asn Trp Thr Asp Gly Gly Gly Ile Val
 1 5 10 15
 Asn Ala Val Asn Gly Ser Gly Gly Asn Tyr Ser Val Asn Trp Ser Asn
 20 25 30
 Thr Gly Asn Phe Val Val Gly Lys Gly Trp Thr Thr Gly Ser Pro Phe
 35 40 45

2

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3/23

Arg Thr Ile Asn Tyr Asn Ala Gly Val Trp Ala Pro Asn Gly Asn Gly
50 55 60

Tyr Leu Thr Leu Tyr Gly Trp Thr Arg Ser Pro Leu Ile Glu Tyr Tyr
65 70 75 80

Val Val Asp Ser Trp Gly Thr Tyr Arg Pro Thr Gly Thr Tyr Lys Gly
85 90 95

Thr Val Lys Ser Asp Gly Gly Thr Tyr Asp Ile Tyr Thr Thr Thr Arg
100 105 110

Tyr Asn Ala Pro Ser Ile Asp Gly Asp Arg Thr Thr Phe Thr Gln Tyr
115 120 125

Trp Ser Val Arg Gln Ser Lys Arg Pro Thr Gly Ser Asn Ala Thr Ile
130 135 140

Thr Phe Thr Asn His Val Asn Ala Trp Lys Ser His Gly Met Asn Leu
145 150 155 160

Gly Ser Asn Trp Ala Tyr Gln Val Met Ala Thr Glu Gly Tyr Gln Ser
165 170 175

Ser Gly Ser Ser Asn Val Thr Val Trp
180 185

<210> 4
<211> 201
<212> PRT
<213> Bacillus pumilus

<400> 4
Arg Thr Ile Thr Asn Asn Glu Met Gly Asn His Ser Gly Tyr Asp Tyr
1 5 10 15

Glu Leu Trp Lys Asp Tyr Gly Asn Thr Ser Met Thr Leu Asn Asn Gly
20 25 30

Gly Ala Phe Ser Ala Gly Trp Asn Asn Ile Gly Asn Ala Leu Phe Arg
35 40 45

Lys Gly Lys Lys Phe Asp Ser Thr Arg Thr His His Gln Leu Gly Asn
50 55 60

Ile Ser Ile Asn Tyr Asn Ala Ser Phe Asn Pro Ser Gly Asn Ser Tyr
65 70 75 80

Leu Cys Val Tyr Gly Trp Thr Gln Ser Pro Leu Ala Glu Tyr Tyr Ile
85 90 95

Val Asp Ser Trp Gly Thr Tyr Arg Pro Thr Gly Ala Tyr Lys Gly Ser
100 105 110

Phe Tyr Ala Asp Gly Gly Thr Tyr Asp Ile Tyr Glu Thr Thr Arg Val
115 120 125

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4 / 23

Asn Gln Pro Ser Ile Ile Gly Ile Ala Thr Phe Lys Gln Tyr Trp Ser
130 135 140

Val	Arg	Gln	Thr	Lys	Arg	Thr	Ser	Gly	Thr	Val	Ser	Val	Ser	Ala	His
145					150					155					160

Phe Arg Lys Trp Glu Ser Leu Gly Met Pro Met Gly Lys Met Tyr Glu
165 170 175

Thr Ala Phe Thr Val Glu Gly Tyr Gln Ser Ser Gly Ser Ala Asn Val
180 185 190

Met Thr Asn Gln Leu Phe Ile Gly Asn
195 200

<210> 5

<211> 185

<212> PRT

<213> Bacillus subtilis

<400> 5

Ala Ser Thr Asp Tyr Trp Gln Asn Trp Thr Asp Gly Gly Gly Ile Val
1 5 10 15

Asn Ala Val Asn Gly Ser Gly Gly Asn Tyr Ser Val Asn Trp Ser Asn
20 25 30

Thr Gly Asn Phe Val Val Gly Lys Gly Trp Thr Thr Gly Ser Pro Phe
35 40 45

Arg Thr Ile Asn Tyr Asn Ala Gly Val Trp Ala Pro Asn Gly Asn Gly
50 55 60

Tyr Leu Thr Leu Tyr Gly Trp Thr Arg Ser Pro Leu Ile Glu Tyr Tyr
65 70 75 80

Val Val Asp Ser Trp Gly Thr Tyr Arg Pro Thr Gly Thr Tyr Lys Gly
85 90 95

Thr Val Lys Ser Asp Gly Gly Thr Tyr Asp Ile Tyr Thr Thr Thr Arg
100 105 110

Tyr Asn Ala Pro Ser Ile Asp Gly Asp Arg Thr Thr Phe Thr Gln Tyr
115 120 125

Trp Ser Val Arg Gln Ser Lys Arg Pro Thr Gly Ser Asn Ala Thr Ile
130 135 140

Thr Phe Ser Asn His Val Asn Ala Trp Lys Ser His Gly Met Asn Leu
145 150 155 160

Gly Ser Asn Trp Ala Tyr Gln Val Met Ala Thr Glu Gly Tyr Gln Ser
165 170 175

Ser Gly Ser Ser Asn Val Thr Val Trp
180 185

5/23

<210> 6
 <211> 211
 <212> PRT
 <213> Clostridium acetobutylicum

<400> 6
 Ser Ala Phe Asn Thr Gln Ala Ala Pro Lys Thr Ile Thr Ser Asn Glu
 1 5 10 15
 Ile Gly Val Asn Gly Gly Tyr Asp Tyr Glu Leu Trp Lys Asp Tyr Gly
 20 25 30
 Asn Thr Ser Met Thr Leu Lys Asn Gly Gly Ala Phe Ser Cys Gln Trp
 35 40 45
 Ser Asn Ile Gly Asn Ala Leu Phe Arg Lys Gly Lys Lys Phe Asn Asp
 50 55 60
 Thr Gln Thr Tyr Lys Gln Leu Gly Asn Ile Ser Val Asn Tyr Asn Cys
 65 70 75 80
 Asn Tyr Gln Pro Tyr Gly Asn Ser Tyr Leu Cys Val Tyr Gly Trp Thr
 85 90 95
 Ser Ser Pro Leu Val Glu Tyr Tyr Ile Val Asp Ser Trp Gly Ser Trp
 100 105 110
 Arg Pro Pro Gly Gly Thr Ser Lys Gly Thr Ile Thr Val Asp Gly Gly
 115 120 125
 Ile Tyr Asp Ile Tyr Glu Thr Thr Arg Ile Asn Gln Pro Ser Ile Gln
 130 135 140
 Gly Asn Thr Thr Phe Lys Gln Tyr Trp Ser Val Arg Arg Thr Lys Arg
 145 150 155 160
 Thr Ser Gly Thr Ile Ser Val Ser Lys His Phe Ala Ala Trp Glu Ser
 165 170 175
 Lys Gly Met Pro Leu Gly Lys Met His Glu Thr Ala Phe Asn Ile Glu
 180 185 190
 Gly Tyr Gln Ser Ser Gly Lys Ala Asp Val Asn Ser Met Ser Ile Asn
 195 200 205
 Ile Gly Lys
 210

<210> 7
 <211> 206
 <212> PRT
 <213> Clostridium stercorarium

<400> 7
 Gly Arg Ile Ile Tyr Asp Asn Glu Thr Gly Thr His Gly Gly Tyr Asp
 1 5 10 15

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6 / 23

Tyr	Glu	Leu	Trp	Lys	Asp	Tyr	Gly	Asn	Thr	Ile	Met	Glu	Leu	Asn	Asp
			20					25						30	
Gly	Gly	Thr	Phe	Ser	Cys	Gln	Trp	Ser	Asn	Ile	Gly	Asn	Ala	Leu	Phe
			35				40					45			
Arg	Lys	Gly	Arg	Lys	Phe	Asn	Ser	Asp	Lys	Thr	Tyr	Gln	Glu	Leu	Gly
			50			55					60				
Asp	Ile	Val	Val	Glu	Tyr	Gly	Cys	Asp	Tyr	Asn	Pro	Asn	Gly	Asn	Ser
					70					75					80
Tyr	Leu	Cys	Val	Tyr	Gly	Trp	Thr	Arg	Asn	Phe	Leu	Val	Glu	Tyr	Tyr
				85					90					95	
Ile	Val	Glu	Ser	Trp	Gly	Ser	Trp	Arg	Pro	Pro	Gly	Ala	Thr	Pro	Lys
				100				105					110		
Gly	Thr	Ile	Thr	Gln	Trp	Met	Ala	Gly	Thr	Tyr	Glu	Ile	Tyr	Glu	Thr
				115			120				125				
Thr	Arg	Val	Asn	Gln	Pro	Ser	Ile	Asp	Gly	Thr	Ala	Thr	Phe	Gln	Gln
					135						140				
Tyr	Trp	Ser	Val	Arg	Ser	Lys	Arg	Thr	Ser	Gly	Thr	Ile	Ser	Val	
				150					155					160	
Thr	Glu	His	Phe	Lys	Gln	Trp	Glu	Arg	Met	Gly	Met	Arg	Met	Gly	Lys
				165					170					175	
Met	Tyr	Glu	Val	Ala	Leu	Thr	Val	Glu	Gly	Tyr	Gln	Ser	Ser	Gly	Tyr
				180				185					190		
Ala	Asn	Val	Tyr	Lys	Asn	Glu	Ile	Arg	Ile	Gly	Ala	Asn	Pro		
				195			200					205			

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<210> 8
<211> 211
<212> PRT
<213> Ruminococcus flavefaciens
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⁴⁰⁰ 8
 Ser Ala Ala Asp Gln Gln Thr Arg Gly Asn Val Gly Gly Tyr Asp Tyr
 1 5 10 15
 Glu Met Trp Asn Gln Asn Gly Gln Gly Gln Ala Ser Met Asn Pro Gly
 20 25 30
 Ala Gly Ser Phe Thr Cys Ser Trp Ser Asn Ile Glu Asn Phe Leu Ala
 35 40 45
 Arg Met Gly Lys Asn Tyr Asp Ser Gln Lys Lys Asn Tyr Lys Ala Phe
 50 55 60
 Cys Asn Ile Val Leu Thr Tyr Asp Val Glu Tyr Thr Pro Arg Gly Asn
 65 70 75 80

7 / 23

Ser Tyr Met Cys Val Tyr Gly Trp Thr Arg Asn Pro Leu Met Glu Tyr 95
 85
 Tyr Ile Val Glu Gly Trp Gly Asp Trp Arg Pro Pro Gly Asn Asp Gly 110
 100
 Glu Val Lys Gly Thr Val Ser Ala Asn Gly Asn Thr Tyr Asp Ile Arg 125
 115
 Lys Thr Met Arg Tyr Asn Gln Pro Ser Leu Asp Gly Thr Ala Thr Phe 140
 130
 Pro Gln Tyr Trp Ser Val Arg Gln Thr Ser Gly Ser Ala Asn Asn Gln 160
 145
 Thr Asn Tyr Met Lys Gly Thr Ile Asp Val Ser Lys His Phe Asp Ala 175
 165
 Trp Ser Ala Ala Gly Leu Asp Met Ser Gly Thr Leu Tyr Glu Val Ser 190
 180
 Leu Asn Ile Glu Gly Tyr Arg Ser Asn Gly Ser Ala Asn Val Lys Ser 205
 195
 Val Ser Val 210
 210
 <210> 9
 <211> 197
 <212> PRT
 <213> Schizophyllum commune
 <400> 9
 Ser Gly Thr Pro Ser Ser Thr Gly Thr Asp Gly Gly Tyr Tyr Ser 15
 1 5 10
 Trp Trp Thr Asp Gly Ala Gly Asp Ala Thr Tyr Gln Asn Asn Gly Gly 30
 20 25
 Gly Ser Tyr Thr Leu Thr Trp Ser Gly Asn Asn Gly Asn Leu Val Gly 45
 35 40
 Gly Lys Gly Trp Asn Pro Gly Ala Ala Ser Arg Ser Ile Ser Tyr Ser 60
 50 55
 Gly Thr Tyr Gln Pro Asn Gly Asn Ser Tyr Leu Ser Val Tyr Gly Trp 80
 65 70 75
 Thr Arg Ser Ser Leu Ile Glu Tyr Tyr Ile Val Glu Ser Tyr Gly Ser 95
 85 90
 Tyr Asp Pro Ser Ser Ala Ala Ser His Lys Gly Ser Val Thr Cys Asn 110
 100 105
 Gly Ala Thr Tyr Asp Ile Leu Ser Thr Trp Arg Tyr Asn Ala Pro Ser 125
 115 120

06907-1210

8/23

Ile Asp Gly Thr Gln Thr Phe Glu Gln Phe Trp Ser Val Arg Asn Pro
 130 135 140

Lys Lys Ala Pro Gly Gly Ser Ile Ser Gly Thr Val Asp Val Gln Cys
 145 150 155 160

His Phe Asp Ala Trp Lys Gly Leu Gly Met Asn Leu Gly Ser Glu His
 165 170 175

Asn Tyr Gln Ile Val Ala Thr Glu Gly Tyr Gln Ser Ser Gly Thr Ala
 180 185 190

Thr Ile Thr Val Thr
 195

<210> 10
 <211> 191
 <212> PRT
 <213> *Streptomyces lividans*

<400> 10
 Asp Thr Val Val Thr Thr Asn Gln Glu Gly Thr Asn Asn Gly Tyr Tyr
 1 5 10 15

Tyr Ser Phe Trp Thr Asp Ser Gln Gly Thr Val Ser Met Asn Met Gly
 20 25 30

Ser Gly Gly Gln Tyr Ser Thr Ser Trp Arg Asn Thr Gly Asn Phe Val
 35 40 45

Ala Gly Lys Gly Trp Ala Asn Gly Gly Arg Arg Thr Val Gln Tyr Ser
 50 55 60

Gly Ser Phe Asn Pro Ser Gly Asn Ala Tyr Leu Ala Leu Tyr Gly Trp
 65 70 75 80

Thr Ser Asn Pro Leu Val Glu Tyr Tyr Ile Val Asp Asn Trp Gly Thr
 85 90 95

Tyr Arg Pro Thr Gly Glu Tyr Lys Gly Thr Val Thr Ser Asp Gly Gly
 100 105 110

Thr Tyr Asp Ile Tyr Lys Thr Thr Arg Val Asn Lys Pro Ser Val Glu
 115 120 125

Gly Thr Arg Thr Phe Asp Gln Tyr Trp Ser Val Arg Gln Ser Lys Arg
 130 135 140

Thr Gly Gly Thr Ile Thr Thr Gly Asn His Phe Asp Ala Trp Ala Arg
 145 150 155 160

Ala Gly Met Pro Leu Gly Asn Phe Ser Tyr Tyr Met Ile Asn Ala Thr
 165 170 175

Glu Gly Tyr Gln Ser Ser Gly Thr Ser Ser Ile Asn Val Gly Gly
 180 185 190

9/23

<210> 11
 <211> 191
 <212> PRT
 <213> Streptomyces lividans

<400> 11
 Ala Thr Thr Ile Thr Thr Asn Gln Thr Gly Thr Asp Gly Met Tyr Tyr
 1 5 10 15
 Ser Phe Trp Thr Asp Gly Gly Gly Ser Val Ser Met Thr Leu Asn Gly
 20 25 30
 Gly Gly Ser Tyr Ser Thr Gln Trp Thr Asn Cys Gly Asn Phe Val Ala
 35 40 45
 Gly Lys Gly Trp Ser Thr Gly Asp Gly Asn Val Arg Tyr Asn Gly Tyr
 50 55 60
 Phe Asn Pro Val Gly Asn Gly Tyr Gly Cys Leu Tyr Gly Trp Thr Ser
 65 70 75 80
 Asn Pro Leu Val Glu Tyr Tyr Ile Val Asp Asn Trp Gly Ser Tyr Arg
 85 90 95
 Pro Thr Gly Thr Tyr Lys Gly Thr Val Ser Ser Asp Gly Gly Thr Tyr
 100 105 110
 Asp Ile Tyr Gln Thr Thr Arg Tyr Asn Ala Pro Ser Val Glu Gly Thr
 115 120 125
 Lys Thr Phe Gln Gln Tyr Trp Ser Val Arg Gln Ser Lys Val Thr Ser
 130 135 140
 Gly Ser Gly Thr Ile Thr Thr Gly Asn His Phe Asp Ala Trp Ala Arg
 145 150 155 160
 Ala Gly Met Asn Met Gly Gln Phe Arg Tyr Tyr Met Ile Asn Ala Thr
 165 170 175
 Glu Gly Tyr Gln Ser Ser Gly Ser Ser Asn Ile Thr Val Ser Gly
 180 185 190

<210> 12
 <211> 189
 <212> PRT
 <213> Streptomyces sp.

<400> 12
 Ala Thr Thr Ile Thr Asn Glu Thr Gly Tyr Asp Gly Met Tyr Tyr Ser
 1 5 10 15
 Phe Trp Thr Asp Gly Gly Gly Ser Val Ser Met Thr Leu Asn Gly Gly
 20 25 30
 Gly Ser Tyr Ser Thr Arg Trp Thr Asn Cys Gly Asn Phe Val Ala Gly
 35 40 45

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10/23

Lys Gly Trp Ala Asn Gly Gly Arg Arg Thr Val Arg Tyr Thr Gly Trp
50 55 60

Phe Asn Pro Ser Gly Asn Gly Tyr Gly Cys Leu Tyr Gly Trp Thr Ser
65 70 75 80

Asn Pro Leu Val Glu Tyr Tyr Ile Val Asp Asn Trp Gly Ser Tyr Arg
85 90 95

Pro Thr Gly Glu Thr Thr Arg Gly Thr Val His Ser Asp Gly Gly Thr Tyr
100 105 110

Asp Ile Tyr Lys Thr Thr Arg Tyr Asn Ala Pro Ser Val Glu Ala Pro
115 120 125

Ala Ala Phe Asp Gln Tyr Trp Ser Val Arg Gln Ser Lys Val Thr Ser
130 135 140

Gly Thr Ile Thr Thr Gly Asn His Phe Asp Ala Trp Ala Arg Ala Gly
145 150 155 160

Met Asn Met Gly Asn Phe Arg Tyr Tyr Met Ile Asn Ala Thr Glu Gly
165 170 175

Tyr Gln Ser Ser Gly Ser Ser Thr Ile Thr Val Ser Gly
180 185

<210> 13
<211> 189
<212> PRI
<213> Thermomonospora fusca

<400> 13
Ala Val Thr Ser Asn Glu Thr Gly Tyr His Asp Gly Tyr Phe Tyr Ser
1 5 10 15

Phe Trp Thr Asp Ala Pro Gly Thr Val Ser Met Glu Leu Gly Pro Gly
20 25 30

Gly Asn Tyr Ser Thr Ser Trp Arg Asn Thr Gly Asn Phe Val Ala Gly
35 40 45

Lys Gly Trp Ala Thr Gly Gly Arg Arg Thr Val Thr Tyr Ser Ala Ser
50 55 60

Phe Asn Pro Ser Gly Asn Ala Tyr Leu Thr Leu Tyr Gly Trp Thr Arg
65 70 75 80

Asn Pro Leu Val Glu Tyr Tyr Ile Val Glu Ser Trp Gly Thr Tyr Arg
85 90 95

Pro Thr Gly Thr Tyr Met Gly Thr Val Thr Thr Asp Gly Gly Thr Tyr
100 105 110

Asp Ile Tyr Lys Thr Thr Arg Tyr Asn Ala Pro Ser Ile Glu Gly Thr
115 120 125

09900874-121001

11/23

Arg Thr Phe Asp Gln Tyr Trp Ser Val Arg Gln Ser Lys Arg Thr Ser
130 135 140

Gly Thr Ile Thr Ala Gly Asn His Phe Asp Ala Trp Ala Arg His Gly
145 150 155 160

Met His Leu Gly Thr His Asp Tyr Met Ile Met Ala Thr Glu Gly Tyr
165 170 175

Gln Ser Ser Gly Ser Ser Asn Val Thr Leu Gly Thr Ser
180 185

<210> 14

<211> 190

<212> PRT

<213> Trichoderma harzianum

<400> 14

Gln Thr Ile Gly Pro Gly Thr Gly Tyr Ser Asn Gly Tyr Tyr Tyr Ser
1 5 10 15

Tyr Trp Asn Asp Gly His Ala Gly Val Thr Tyr Thr Asn Gly Gly Gly
20 25 30

Gly Ser Phe Thr Val Asn Trp Ser Asn Ser Gly Asn Phe Val Gly Gly
35 40 45

Lys Gly Trp Gln Pro Gly Thr Lys Asn Lys Val Ile Asn Phe Ser Gly
50 55 60

Ser Tyr Asn Pro Asn Gly Asn Ser Tyr Leu Ser Ile Tyr Gly Trp Ser
65 70 75 80

Arg Asn Pro Leu Ile Glu Tyr Tyr Ile Val Glu Asn Phe Gly Thr Tyr
85 90 95

Asn Pro Ser Thr Gly Ala Thr Lys Leu Gly Glu Val Thr Ser Asp Gly
100 105 110

Ser Val Tyr Asp Ile Tyr Arg Thr Gln Arg Val Asn Gln Pro Ser Ile
115 120 125

Ile Gly Thr Ala Thr Phe Tyr Gln Tyr Trp Ser Val Arg Arg Asn His
130 135 140

Arg Ser Ser Gly Ser Val Asn Thr Ala Asn His Phe Asn Ala Trp Ala
145 150 155 160

Ser His Gly Leu Thr Leu Gly Thr Met Asp Tyr Gln Ile Val Ala Val
165 170 175

Glu Gly Tyr Phe Ser Ser Gly Ser Ala Ser Ile Thr Val Ser
180 185 190

<210> 15

11

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12/23

<211> 178
 <212> PRT
 <213> *Trichoderma reesei*

<400> 15
 Ala Ser Ile Asn Tyr Asp Gln Asn Tyr Gln Thr Gly Gly Gln Val Ser
 1 5 10 15
 Tyr Ser Pro Ser Asn Thr Gly Phe Ser Val Asn Trp Asn Thr Gln Asp
 20 25 30
 Asp Phe Val Val Gly Val Gly Trp Thr Thr Gly Ser Ser Ala Pro Ile
 35 40 45
 Asn Phe Gly Gly Ser Phe Ser Val Asn Ser Gly Thr Gly Leu Leu Ser
 50 55 60
 Val Tyr Gly Trp Ser Thr Asn Pro Leu Val Glu Tyr Tyr Ile Met Glu
 65 70 75 80
 Asp Asn His Asn Tyr Pro Ala Gln Gly Thr Val Lys Gly Thr Val Thr
 85 90 95
 Ser Asp Gly Ala Thr Tyr Thr Ile Trp Glu Asn Thr Arg Val Asn Glu
 100 105 110
 Pro Ser Ile Gln Gly Thr Ala Thr Phe Asn Gln Tyr Ile Ser Val Arg
 115 120 125
 Asn Ser Pro Arg Thr Ser Gly Thr Val Thr Val Gln Asn His Phe Asn
 130 135 140
 Trp Ala Ser Leu Gly Leu His Leu Gly Gln Met Met Asn Tyr Gln Val
 145 150 155 160
 Val Ala Val Glu Gly Trp Gly Gly Ser Gly Ser Ala Ser Gln Ser Val
 165 170 175
 Ser Asn

<210> 16
 <211> 190
 <212> PRT
 <213> *Trichoderma reesei*

<400> 16
 Gln Thr Ile Gln Pro Gly Thr Gly Tyr Asn Asn Gly Tyr Phe Tyr Ser
 1 5 10 15
 Tyr Trp Asn Asp Gly His Gly Gly Val Thr Tyr Thr Asn Gly Pro Gly
 20 25 30
 Gly Gln Phe Ser Val Asn Trp Ser Asn Ser Gly Asn Phe Val Gly Gly
 35 40 45
 Lys Gly Trp Gln Pro Gly Thr Lys Asn Lys Val Ile Asn Phe Ser Gly

12

13/23

50 55 60

Ser Tyr Asn Pro Asn Gly Asn Ser Tyr Leu Ser Val Tyr Gly Trp Ser
65 70 75 80

Arg Asn Pro Leu Ile Glu Tyr Tyr Ile Val Glu Asn Phe Gly Thr Tyr
85 90 95

Asn Pro Ser Thr Gly Ala Thr Lys Leu Gly Glu Val Thr Ser Asp Gly
100 105 110

Ser Val Tyr Asp Ile Tyr Arg Thr Gln Arg Val Asn Gln Pro Ser Ile
115 120 125

Ile Gly Thr Ala Thr Phe Tyr Gln Tyr Trp Ser Val Arg Arg Asn His
130 135 140

Arg Ser Ser Gly Ser Val Asn Thr Ala Asn His Phe Asn Ala Trp Ala
145 150 155 160

Gln Gln Gly Leu Thr Leu Gly Thr Met Asp Tyr Gln Ile Val Ala Val
165 170 175

Glu Gly Tyr Phe Ser Ser Gly Ser Ala Ser Ile Thr Val Ser
180 185 190

<210> 17
<211> 190
<212> PRT
<213> *Trichoderma viride*

<400> 17
Gln Thr Ile Gln Pro Gly Thr Gly Phe Asn Asn Gly Tyr Phe Tyr Ser
1 5 10 15

Tyr Trp Asn Asp Gly His Gly Gly Val Thr Tyr Thr Asn Gly Pro Gly
20 25 30

Gly Gln Phe Ser Val Asn Trp Ser Asn Ser Gly Asn Phe Val Gly Gly
35 40 45

Lys Gly Trp Gln Pro Gly Thr Lys Asn Lys Val Ile Asn Phe Ser Gly
50 55 60

Ser Tyr Asn Pro Asn Gly Asn Ser Tyr Leu Ser Val Tyr Gly Trp Ser
65 70 75 80

Arg Asn Pro Leu Ile Glu Tyr Tyr Ile Val Glu Asn Phe Gly Thr Tyr
85 90 95

Asn Pro Ser Thr Gly Ala Thr Lys Leu Gly Glu Val Thr Ser Asp Gly
100 105 110

Ser Val Tyr Asp Ile Tyr Arg Thr Gln Arg Val Asn Gln Pro Ser Ile
115 120 125

Ile Gly Thr Ala Thr Phe Tyr Gln Tyr Trp Ser Val Arg Arg Thr His

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14/23

130 135 140
 Arg Ser Ser Gly Ser Val Asn Thr Ala Asn His Phe Asn Ala Trp Ala
 145 150 155 160
 Gln Gln Gly Leu Thr Leu Gly Thr Met Asp Tyr Gln Ile Val Ala Val
 165 170 175
 Glu Gly Tyr Phe Ser Ser Gly Ser Ala Ser Ile Thr Val Ser
 180 185 190

 <210> 18
 <211> 202
 <212> PRT
 <213> Fibrobacter succinogenes

 <400> 18
 Asn Ser Ser Val Thr Gly Asn Val Gly Ser Ser Pro Tyr His Tyr Glu
 1 5 10 15
 Ile Trp Tyr Gln Gly Gly Asn Asn Ser Met Thr Phe Tyr Asp Asn Gly
 20 25 30
 Thr Tyr Lys Ala Ser Trp Asn Gly Thr Asn Asp Phe Leu Ala Arg Val
 35 40 45
 Gly Phe Lys Tyr Asp Glu Lys His Thr Tyr Glu Glu Leu Gly Pro Ile
 50 55 60
 Asp Ala Tyr Tyr Lys Trp Ser Lys Gln Gly Ser Ala Gly Gly Tyr Asn
 65 70 75 80
 Tyr Ile Gly Ile Tyr Gly Trp Thr Val Asp Pro Leu Val Glu Tyr Tyr
 85 90 95
 Ile Val Asp Asp Trp Phe Asn Lys Pro Gly Ala Asn Leu Leu Gly Gln
 100 105 110
 Arg Lys Gly Glu Phe Thr Val Asp Gly Asp Thr Tyr Glu Ile Trp Gln
 115 120 125
 Asn Thr Arg val Gln Gln Pro Ser Ile Lys Gly Thr Gln Thr Phe Pro
 130 135 140
 Gln Tyr Phe Ser Val Arg Lys Ser Ala Arg Ser Cys Gly His Ile Asp
 145 150 155 160
 Ile Thr Ala His Met Lys Lys Trp Glu Glu Leu Gly Met Lys Met Gly
 165 170 175
 Lys Met Tyr Glu Ala Lys Val Leu Val Glu Ala Gly Gly Gly Ser Gly
 180 185 190
 Ser Phe Asp Val Thr Tyr Phe Lys Met Thr
 195 200

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15/23

<210> 19
 <211> 189
 <212> PRT
 <213> *Aspergillus awamorii*
 <400> 19
 Arg Ser Thr Pro Ser Ser Thr Gly Glu Asn Asn Gly Tyr Tyr Tyr Ser
 1 5 10 15
 Phe Trp Thr Asp Gly Gly Gly Asp Val Thr Tyr Thr Asn Gly Asn Ala
 20 25 30
 Gly Ser Tyr Ser Val Glu Trp Ser Asn Val Gly Asn Phe Val Gly Gly
 35 40 45
 Lys Gly Trp Asn Pro Gly Ser Ala Lys Asp Ile Thr Tyr Ser Gly Asn
 50 55 60
 Phe Thr Pro Ser Gly Asn Gly Tyr Leu Ser Val Tyr Gly Trp Thr Thr
 65 70 75 80
 Asp Pro Leu Ile Glu Tyr Tyr Ile Val Glu Ser Tyr Gly Asp Tyr Asn
 85 90 95
 Pro Gly Ser Gly Gly Thr Thr Arg Gly Asn Val Ser Ser Asp Gly Ser
 100 105 110
 Val Tyr Asp Ile Tyr Thr Ala Thr Arg Thr Asn Ala Pro Ser Ile Asp
 115 120 125
 Gly Thr Gln Thr Phe Ser Gln Tyr Trp Ser Val Arg Gln Asn Lys Arg
 130 135 140
 Val Gly Gly Thr Val Thr Thr Ser Asn His Phe Asn Ala Trp Ala Lys
 145 150 155 160
 Leu Gly Met Asn Leu Gly Thr His Asn Tyr Gln Ile Leu Ala Thr Glu
 165 170 175
 Gly Tyr Gln Ser Ser Gly Ser Ser Ile Thr Ile Gln
 180 185

<210> 20
 <211> 194
 <212> PRT
 <213> *Thermomyces lanuginosus*
 <400> 20
 Gln Thr Thr Pro Asn Ser Glu Gly Trp His Asp Gly Tyr Tyr Tyr Ser
 1 5 10 15
 Trp Trp Ser Asp Gly Gly Ala Gln Ala Thr Tyr Thr Asn Leu Glu Gly
 20 25 30
 Gly Thr Tyr Glu Ile Ser Trp Gly Asp Gly Gly Asn Leu Val Gly Gly
 35 40 45
 Lys Gly Trp Asn Pro Gly Leu Asn Ala Arg Ala Ile His Phe Glu Gly

15

0999994-112101

16/23

50 55 60

Val Tyr Gln Pro Asn Gly Asn Ser Tyr Leu Ala Val Tyr Gly Trp Thr
65 70 75 80

Arg Asn Pro Leu Val Glu Tyr Tyr Ile Val Glu Asn Phe Gly Thr Tyr
85 90 95

Asp Pro Ser Ser Gly Ala Thr Asp Leu Gly Thr Val Glu Cys Asp Gly
100 105 110

Ser Ile Tyr Arg Leu Gly Lys Thr Thr Arg Val Asn Ala Pro Ser Ile
115 120 125

Asp Gly Thr Gln Thr Phe Asp Gln Tyr Trp Ser Val Arg Gln Asp Lys
130 135 140

Arg Thr Ser Gly Thr Val Gln Thr Gly Cys His Phe Asp Ala Trp Ala
145 150 155 160

Arg Ala Gly Leu Asn Val Asn Gly Asp His Tyr Tyr Gln Ile Val Ala
165 170 175

Thr Glu Gly Tyr Phe Ser Ser Gly Tyr Ala Arg Ile Thr Val Ala Asp
180 185 190

Val Gly

<210> 21
<211> 76
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Trx-1

<400> 21
ctagctaaagc aggcctgcaga tgcataacaat acaaccaggga accggttaca acaacggtta 60
cctttacagc tattgg 76

<210> 22
<211> 78
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: XyTv-2

<400> 22
aacgatggcc atggctgggtg tactatataca aacggggcccg gaggcctaatt tagcgtcaat 60
tgggtataact caggaaac 78

<210> 23
<211> 78

09990874-112101

17/23

<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: TrX-3

```
<400> 23
TTCGTAGGTCG GAAAGAGCTTC GCAACCCGCTG ACCAAAAATA AGGTCGATCAA CTCCTCTGGA 60
CTCTATAATC CGAATGGG                                     78
```

```
<210> 24
<211> 74
<212> DNA
<213> Artificial Sequence
```

<223> Description of Artificial Sequence: XyTv-4

«100» 24
aaaccataac taaaggggctca tgggtgggtct agaaaacccac tgattgaaata cacatttgtc 60
gaaaaatctcgg gctac 74

```
<210> 25
<211> 51
<212> DNA
<213> Artificial Sequence
```

<223> Description of Artificial Sequence: TrX-8

<400> 25
gattccgcccg acgtctaacg tgcctatgtt ggatccctggc caatgttgtt g 51

```
<210> 26
<211> 64
<212> DNA
<213> Artificial Sequence
```

<223> Description of Artificial Sequence: XyTv-7

```
<400> 25
cgaatgaaaa tgtcgacaaac ctctgctaccg gaccacccaac aatgggataatg ctctgcctgggg 60
ctctcgggtta aatctcagctt aacc                                     84
```

```
<210> 27
<211> 78
<212> DNA
<213> Artificial Sequence
```

<223> Description of Artificial Sequence: TrX-6

<400> 27

18/23

agattgaggc ctttgaagca tccaccttct ccaaccgctg ggcccggtt ttattccac 60
tagttgaaga gacctaga 78

<210> 28
<211> 85
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: XyTv-5

<400> 28
arataggct tacccttaag tatgaattcg cagataccga ccagatcttc gggtagctaa 60
cttataatgt aacagctcttc aaagc 85

<210> 28
<211> 58
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: XyTv-101

<400> 29
tcgaacaatt cggtaacctac aatccgagta ccggcgccac aaaattaggc gaagtcac 58

<210> 30
<211> 53
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: XyTv-102

<400> 30
tagtgatgga tccgtatctg atatctacog taccacaagc gttaatcagc cat 53

<210> 31
<211> 59
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: TrX-103

<400> 31
cgatcattgg aaccgccacc ttttaccagt actggagrgt tagaogtaat catcgggagc 59

<210> 32
<211> 69
<212> DNA
<213> Artificial Sequence

18

19/23

<220>

<223> Description of Artificial Sequence: XyTV-104

<400> 32

tccggtcgg ttaactctgc gaacacattt aatgcattgg cacagcaagg gttacacctt 60
ggcacaatg 69

<210> 33

<211> 67

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: XyTV-105

<400> 33

gattatcaca tcttagcggc ggaaggctac ttctcagctg gttccgctag caccacagtg 60
agctaaa 67

<210> 34

<211> 73

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: XyTV-110

<400> 34

gtcaaaagcca tggargctag gctcarggcc gcggctgtttt aatccgcttc agtgatcact 60
acctaggcat ata 73

<210> 35

<211> 54

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: XyTV-109

<400> 35

ctacagatgg catgggctgc gcaattagtc ggtagctagt aaccttggcg gtcg 54

<210> 36

<211> 60

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: XyTV-108

<400> 36

aaaaatagta tgacctcaca atctgcattt gtagcctcga ggccaagcca attatgacgc 60

19

20/23

<210> 37
 <211> 66
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> Description of Artificial Sequence: XyTV-107

<400> 37
 ttagtgaaat tacgtaccgc tgcgtctccc aattggggatc cactgtacct aatagcttag 60
 catgc 66

<210> 38
 <211> 53
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> Description of Artificial Sequence: XyTV-106

<400> 38
 caccctccga tgaagagctc accaaggcga tctaatgtgc acctcgatttc tag 53

<210> 39
 <211> 596
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> Description of Artificial Sequence: TrX

<400> 39
 ctgagctagg aggcgtgcaga tgcatacaat acaaccagga accgggtaca acaacggrra 60
 cttttacagc tarrggaaac atggccatgg tgggtttacc taracaaacg ggcccgagg 120
 ccaattttagc gtcaatttggc tcaacttcgc aaacttcgta ggtgggaaag gttggcgaac 180
 cgggaccaaa aattaaggrra tcaacttcgc tggatcttat aatccgaatg ggaattcata 240
 cttaaagctc tatggcrrgt cragaaaccc acrtgattga tattacattg tggaaaattt 300
 cggtaaccrac aatccgagrra cgggcgccac aaaaatraggc gaagtcaacta gtgatggarc 360
 cgttatatgat atctacogta cccaacgcgt taaatcgcca tcatcattg gaaccgccac 420
 cttttatcag tactggagtg tttagacgtaa tcatcggagc tccggrrtgg ttaatactgc 480
 gmarcaccrr aatgcacggg cacagcaagg gttaacccta ggcacaatgg attatcaaat 540
 cgtagcggcg gaaggttact tctcgagtgg ttccgctagt attacagtga gctaaa 596

<210> 40
 <211> 36
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> Description of Artificial Sequence: Tx-75a-1

<400> 40
 tgggaattca tacrragccg tctatggcgtg gtctag 36

20

21 /23

```

<210> 41
<211> 42
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Tx-105H-1

<400> 41
accggcgcca caaaacacggg cgaagtcact agtgatggat cc          42

<210> 42
<211> 44
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Tx-C1

<400> 42
ccaaggcgat cataatgtca ctgcattctt agaaccttoga accc          43

<210> 43
<211> 36
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Tx-del(123-144)-1r

<400> 43
cggagctccg acgcgttggg tacggtagat atcata          36

<210> 44
<211> 42
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Tx-105R-1

<400> 44
accggcgcca caaaaagagg cgaagtcact agtgatggat cc          42

<210> 45
<211> 41
<212> DNA
<213> Artificial Sequence

<220> 41
<223> Description of Artificial Sequence: Tx-NI

<400> 45

```

22 /23

ctagcraagg aggcctgcaca tgcacaacaat acaaccaggga a

41

<210> 46
<211> 36
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: TX-75G-1

<400> 46
tgggaattca tacttaggcg tctatggctg gctctag

36

<210> 47
<211>
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: TX-144R-1r

<400> 47

<210> 48
<211>
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: TX-161R-1r

<400> 48

<210> 49
<211> 40
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: TX-125A-129E-1

<400> 49
ccaacgcgctt aatgcgccat cgatcgaggg aacgcgcacc

40

<210> 50
<211>
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: TX-116G-1

22

09900874-112101

23 /23

<400> 50

<210> 51

<211>

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: TX-118C-1

<400> 52

<210> 52

<211>

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: TX-10H11D

<400> 52

<210> 53

<211>

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: TX-116G-118C-1

<400> 53

<210> 54

<211>

<212> DNA

<213> Aspergillus kawachii

<400> 54